

Application Serial No. 10/734,108  
Amendment dated January 4, 2006  
Reply to Office action of October 4, 2005

### **REMARKS**

Claims 1-6 are pending in this application. No amendments have been made in this response. Reconsideration of all outstanding rejections is respectfully requested for the reasons that follow.

Claims 1, 3, 5 and 6 were rejected under 35 U.S.C. 103(a) as being unpatentable over Shibata et al. in view of Brinegar et al. The Patent Office admits that Shibata fails to teach applying an EM field to a sleeve containing molten metal before the completion of loading the molten metal to the sleeve. However, the Patent Office contends that Brinegar cures Shibata's defect, citing Brinegar, col. 3, ll. 56+. Applicants respectfully submit that the Patent Office incorrectly equates the mold of Brinegar with the sleeve in the instant claims since the Patent Office argues "[h]owever, Brinegar et al. (col. 3, lines 56+) teach the use of applying an EM field before or during loading the molten metal to the sleeve (mold) for the purpose of controlling the finegrained equiaxed slurry (non-dendritic casting)." Office Action, pp. 2, 4.

Applicants respectfully submit that the mold of Brinegar is not a vessel as set forth in claims 1-6 because the mold is a casting process for shaping as a rheocasting or thixoforming process. Brinegar's *crucible* holds and cools molten metal for injection into Brinegar's mold for shaping, and therefore, Brinegar's crucible should be equated, if at all, with the sleeve set forth in claims 1-6.

The instant application teaches that metallic slurry material is prepared by the claimed apparatus for use in rheocasting or thixoforming and then so prepared metallic

slurry is cast into final products through forging or die casting, which is a rheocasting or thixoforming process. Claim 1, by reciting "discharge a slurry after manufacture from the sleeve" makes it clear that the sleeve in claim 1 is a sleeve for holding and cooling molten metal before the molten metal is injected into a mold for a rheocasting or thixoforming process because the sleeve discharges a slurry rather than a harden final product such as billets.

Brinegar requires molten metal to be kept in a quiescent state while it is in a *crucible*. Brinegar, col. 5, ll. 11-21. In contrast, Brinegar teaches that turbulence may be induced in the molten metal while it is in a *mold*, and applying an EM field prior to pouring molten metal into a mold or while it is in a mold to induce turbulence in the molten metal. Brinegar, col. 3, ll. 56-65. Reliance on Brinegar, col. 3, ll. 56+ reflects that the Patent Office is relying on a teaching for applying an EM field to the *mold* as if that teaches applying an EM field to the *crucible*. Applicants cannot find any teaching or suggestion for applying an EM field to the crucible before the completion of loading molten metal into the crucible in Brinegar. Furthermore, Brinegar teaches that one should not generate turbulence in molten metal in a crucible. Brinegar, col. 5, ll. 55-68; col. 6, ll. 30-42.

Therefore, applicants submit that Brinegar does not teach or suggest applying an EM field to the sleeve holding and cooling molten metal before the completion of loading of molten metal into the sleeve. Further, Brinegar teaches away from applying an EM field to the sleeve since Brinegar teaches that one should maintain a quiescent

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state of the molten metal in the crucible (the sleeve of the instant application) contrary to the instant invention's purpose of inducing stirring or convection by applying an EM field.

Moreover, the instant application teaches that applying an EM field before the completion of loading molten metal into the sleeve (the crucible of Brinegar) results in unexpectedly improved microstructure and cooling time. The Patent Office's attention is respectfully directed to the paragraph 68 of the instant application and the comparative examples 1 & 2 of Co-pending application No. 10/419,929 (which is being examined by the current Examiner) for the proof of the unexpected results.

Therefore, applicants respectfully disagree with the Patent Office's instant rejection since Brinegar does not cure the defect of Shibata for the reasons explained above. As a result, Shibata and Brinegar alone or in combination with each other do not render claim 1 obvious. Further, this application shows that applying the an EM field using the apparatus of claim 1 results in unexpected advantages such as improved microstructure and cooling time. Thus, the applicants submit that the rejection of claim 1 and the rejections of claims 3, 5 and 6, which depend from claim 1, are improper and should be withdrawn.

Claim 2 was rejected under 35 U.S.C. 103(a) as being unpatentable over Shibata et al. in view of Brinegar et al and further in view of Dautre et al. Applicants respectfully disagree. First of all, as explained above, the combination of Shibata and Brinegar does not render claim 1 obvious, and therefore, claim 2, which depends from

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claim 1, cannot be rendered obvious over Shibata in view of Brinegar and further in view of Doutre unless Doutre cures the defect of the combination of Shibata and Brinegar.

Doutre is directed to selection of heating and cooling conditions of molten metallic slurry. Doutre, however, does not teach or suggest applying an EM field to a sleeve holding and cooling molten metallic slurry before the completion of loading of the molten metal into the sleeve. Therefore, Doutre does not cure the defect of the combination of Shibata and Brinegar.

Thus, applicants respectfully disagree with the Patent Office's instant rejection of claim 2 since Doutre does not cure the defect of the combination of Shibata and Brinegar for the reasons explained above. As a result, Shibata, Brinegar and Doutre alone, in combination with one another or all together do not render claim 2 obvious as those references do not render claim 1 obvious. Thus, applicants submit that the rejection of claim 2 is improper and should be withdrawn.

Claim 4 was rejected under 35 U.S.C. 103(a) as being unpatentable over Shibata et al in view of Brinegar et al and further in view of Nakao et al. Applicants respectfully disagree. First of all, as explained above, the combination of Shibata and Brinegar does not render claim 1 obvious, and therefore, claim 4, which depends from claim 1, cannot be rendered obvious over Shibata in view of Brinegar and further in view of Nakao unless Nakao cures the defect of the combination of Shibata and Brinegar.

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Nakao is directed to a method of injecting half-solidified metallic material into a mold. Nakao, however, does not teach or suggest applying an EM field to a sleeve holding and cooling molten metallic slurry before the completion of loading of the molten metal into the sleeve. Therefore, Doutre does not cure the defect of the combination of Shibata and Brinegar.

Thus, applicants respectfully disagree with the Patent Office's instant rejection of claim 4 since Nakao does not cure the defect of the combination of Shibata and Brinegar for the reasons explained above. As a result, Shibata, Brinegar and Nakao alone, in combination with one another or all together do not render claim 4 obvious as those references do not render claim 1 obvious. Thus, applicants submit that the rejection of claim 4 is improper and should be withdrawn.

In light of the foregoing, it is submitted that claims 1 through 6 are allowable over the cited references. Allowance of claims 1 through 6 and of this entire application are therefore respectfully requested.

Respectfully submitted,

By

G. Franklin Rothwell

G. Franklin Rothwell

Attorney for Applicants

Registration No. 18, 125

ROTHWELL, FIGG, ERNST & MANBECK

Suite 800, 1425 K Street, N.W.

Washington, D.C. 20005

Telephone: (202)783-6040

*Joseph A. Hynds*  
Reg No. 34,627  
(JOSEPH A. HYNDS)